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(54) **An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle**

(57) An operating element arrangement for controlling the longitudinal and transverse movement of a motor vehicle has a manually actuable operating element 1 which is designed analogously to a vehicle and which induces an acceleration operation when subjected to force in direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis 4. Preferably the vertical torque axis 4 intersects the rear axle 5 of the imitation vehicle.

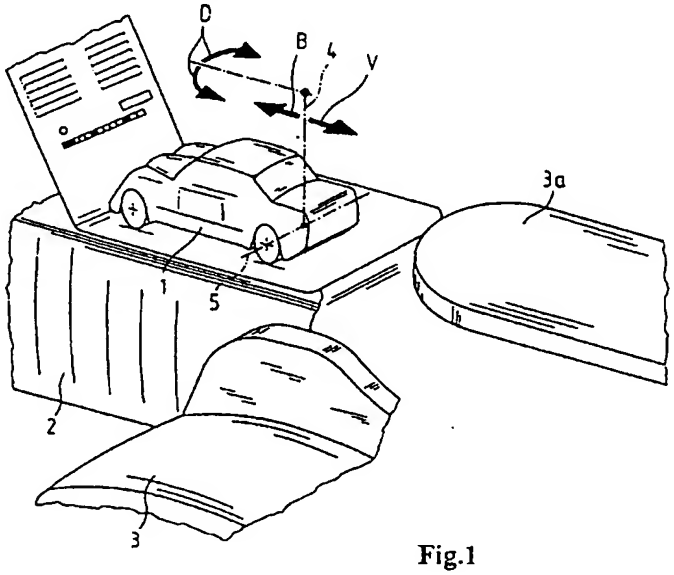

Fig.1

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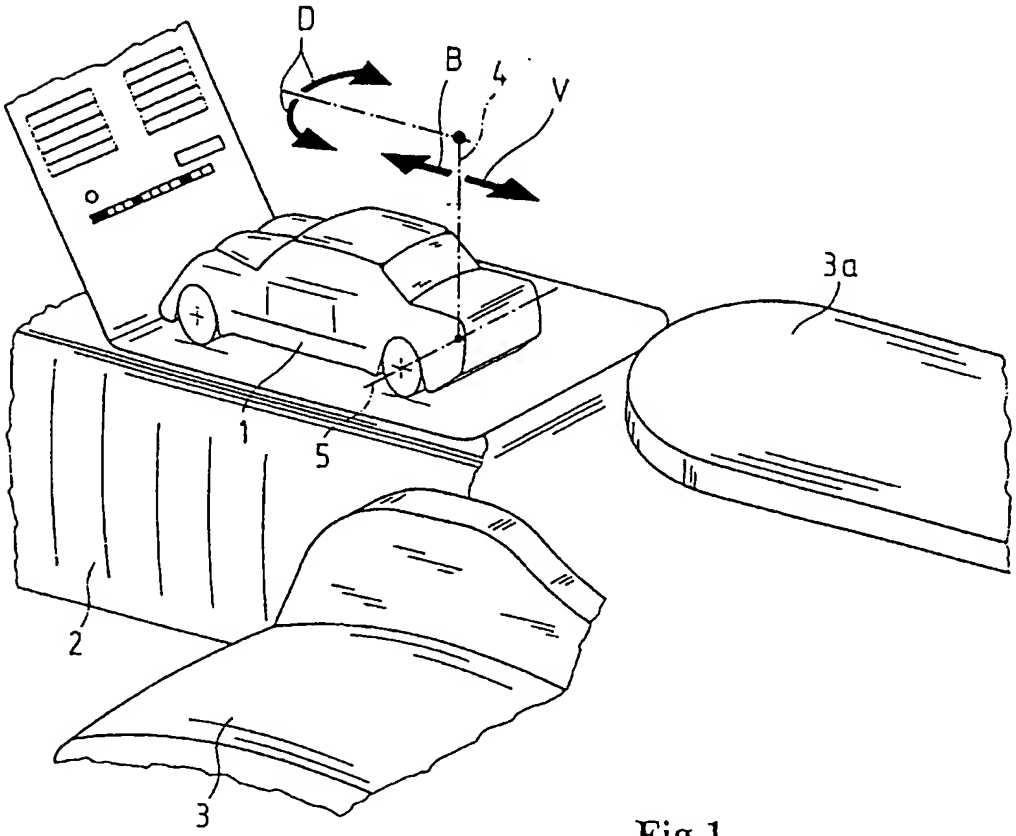

Fig.1

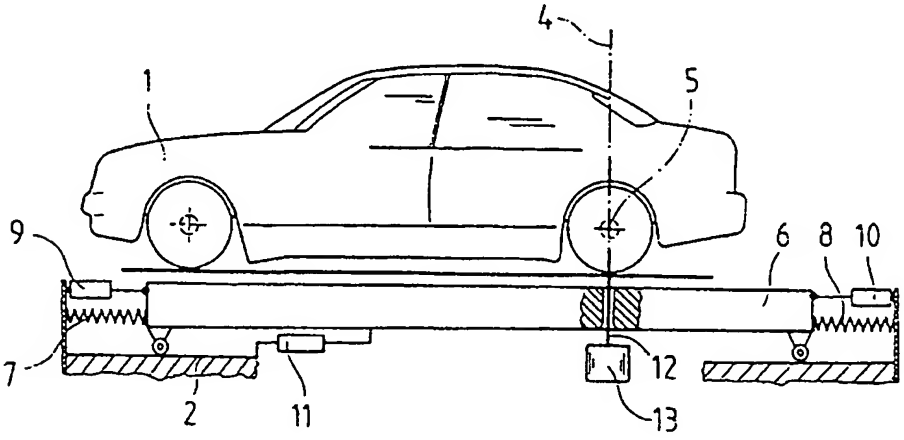

Fig.2

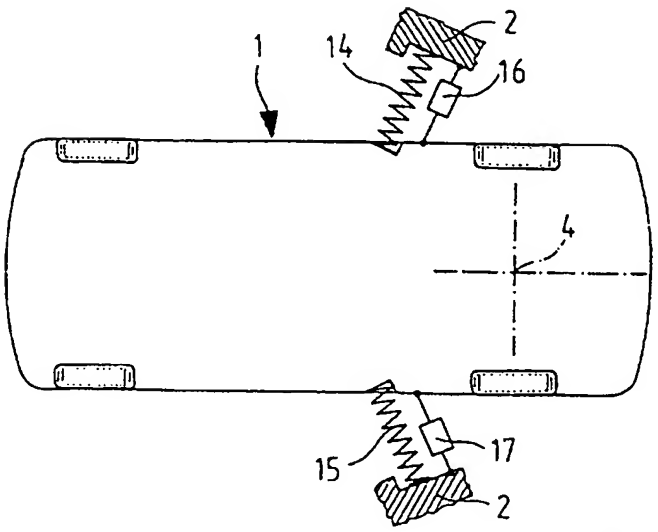

Fig.3

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Operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle

The invention relates to an operating element arrangement for controlling the longitudinal movement and transverse movement of a motor vehicle.

Conventionally, in an automobile, the steering wheel serves as an operating element for controlling the transverse movement and the accelerator pedal and brake pedal serve as operating elements for controlling the longitudinal movement. The paper by P. Bränneby et al., Improved Active and Passive Safety by Using Active Lateral Dynamic Control and an Unconventional Steering Unit, 13th International Technical Conference on Experimental Safety Vehicles, 4th to 7th November 1991, Proceedings Vol. 1, page 224, proposes, as an alternative to the conventional steering wheel, an operating lever which is arranged, for example, on the centre tunnel of the vehicle.

Furthermore, it is known to provide a common operating element for controlling the longitudinal and transverse dynamics of a motor vehicle, preferably the longitudinal movement being controlled by actuating the operating element in the longitudinal direction of the vehicle and the transverse movement being controlled by actuating the latter in the transverse direction, in particular as a rotational movement corresponding to the conventional steering wheel. Such an operating element is disclosed in patent specification US 3,022,850 in the form of a control stick which is mounted on a frame so as to be pivotable about a horizontal transverse axis, the frame, in turn, being rotatable about a horizontal longitudinal axis. A further operating element of this type, which is mentioned in the paper by H. Bubb, Arbeitsplatz Fahrer - Eine ergonomische Studie [Driver's area - an ergonomic study], Automobil-Industrie [Automobile Industry] 3/85, page 265, contains two mechanically interconnected plate-like handles

which are located closely next to one another and which are attached to the end of a bar which is guided movably on the vehicle centre console. The longitudinal dynamics of the vehicle are controlled by displacing the bar in the longitudinal direction of the vehicle, whilst the transverse dynamics are influenced by rotating the two plate-like handles in the transverse plane of the vehicle.

German Patent Application 195 48 717.6, which is not a prior publication, discloses an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, the said arrangement comprising two operating elements which can be actuated independently of one another and each of which is intended for controlling the longitudinal and transverse movements and is preferably designed as a manually actuable control stick. In this case, the manually actuable control sticks are cardanically suspended on a bracket on their underside and are designed as handles extending essentially vertically upwards. Coupling the two operating elements electronically prevents command collisions, for example due to the additive superposition of control command signals, due to the manual passive switching of one operating element in each case or due to the assignment of different priorities for the two operating elements.

The patent specification US 4,701,629 describes an operating element arrangement for activating various electrical vehicle components, such as various lights, front and rear windscreen-wipers, horn, window lifters and deicing system. The arrangement contains a carrier which is designed analogously to a vehicle and on which operating buttons assigned to the vehicle components to be activated are arranged at locations which preferably correspond to the position, on the vehicle, of the respectively associated vehicle component to be activated. The operating-button carrier designed analogously to a vehicle may be arranged on the dashboard or in the middle region of a steering wheel, and, even in the last-mentioned case, it is positioned so as

to be stationary relative to the vehicle, without co-rotating with the steering wheel.

The present invention seeks to provide an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle with a high level of operating and driving comfort.

According to the present invention there is provided an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, including a manually actuable operating element designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis.

This arrangement contains a manually actuable operating element which is designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis. In this case, the design analogous to a vehicle means that the operating element has a vehicle-like shape which may vary between a parallelepipedal shape and an exact miniaturized imitation of the outer contour of the vehicle. At all events, the result of the special mounting of the operating element, such that an actuating force directed transversely forwards brings about a vehicle acceleration, an actuating force directed transversely rearwards brings about a vehicle deceleration and subjecting the operating element to torque about a vertical axis of the operating element parallel to the vertical axis of the vehicle brings about an equidirectional steering movement, is a particularly obvious operating element actuation which is associated directly with the desired vehicle behaviour

and in which the direction of the actuating force corresponds to the driver's intuitive desire for the vehicle behaviour. An essential contribution to this is made by the fact that the control of transverse movement by subjecting the operating element to torque does not take place about an essentially horizontal axis, as in the case of the conventional steering wheel, but about a vertical axis, this matching directly with the corresponding vehicle behaviour during cornering.

In comparison with conventional arrangements having a steering wheel for the control of transverse movement and an accelerator and brake pedal assembly, decoupled from it, for the control of longitudinal movement, the present operating element arrangement achieves further improvements relating to active and passive safety and to ergonomics. Thus, by means of the operating element, higher steering and regulating speeds can be achieved than with a conventional steering wheel, risks of accidents caused by the steering wheel and pedal assembly do not arise and there is no need to change pedals during transfer between braking and accelerating phases of the longitudinal movement of the vehicle. Moreover, dispensing with the steering wheel and the accelerator and brake pedal assembly results in a large amount of free space for placing the instruments. The operating element arrangement enables the driver to have a very comfortable body posture with a free choice of foot position. Furthermore, there is the possibility of shortening the vehicle by the space required hitherto for the steering wheel and the pedal assembly, whilst at the same time ensuring the same amount of space is available and that getting into the vehicle is improved.

In a preferred operating element arrangement, the operating element imitates the outer contour of a vehicle particularly obviously, and the vertical axis, about which the operating element is capable of being subjected to torque, is selected in such a way that it intersects the rear axle of this miniaturized outer contour of a vehicle.

This position of the vertical axis most closely resembles the transverse movements of conventional motor vehicles, in which the steering acts on the front-axle wheels.

In a further preferred operating element arrangement, the operating element imitating the outer contour of a vehicle is arranged on a vehicle centre console or on a separate console which may be positioned differently in the vehicle interior and which, for example, may optionally be positioned on the right-hand side or left-hand side of the driver's seat.

A preferred embodiment of the invention is illustrated in the drawings and is described below. In the drawings:

Figure 1 shows a perspective view of the region of the centre console of a motor vehicle with an operating element for controlling the longitudinal and transverse movements of the vehicle, the said operating element being designed in the form of a vehicle,

Figure 2 shows a diagrammatic view in longitudinal section of the operating element of Figure 1, and

Figure 3 shows a diagrammatic top view of the region of the operating element of Figure 1 designed in the form of a vehicle.

The operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, the said arrangement being shown in Figures 1 to 3 together with its components relevant here, contains an operating element 1, the shape of which imitates the outer contour of a vehicle and which at the same time is designed in an ergonomically favourable way as a handle part. This operating element 1 is arranged on the front horizontal region of a vehicle centre console 2 in a position corresponding to the real vehicle. It can be grasped and actuated comfortably by the right hand of the vehicle driver seated on a driver's seat 3, and the vehicle driver can rest his right arm on a suitably positioned driver's seat armrest

3a. The operating element 1 is mounted on the centre console 2 in such a way that it can be pressed forwards by the driver with a forward-directed force B, pulled rearwards with a rearward-directed force V and optionally subjected to a torque D in the clockwise or counter-clockwise direction, which torque acts about a vertical axis 4 of the miniature-vehicle operating element 1, the said vertical axis intersecting the rear axle 5 of the latter. By means of a suitable sensor assembly [not shown] having a following control unit, the operating element arrangement brings about a conversion of these actuating forces into corresponding control operations for the longitudinal and transverse movements of the vehicle.

For this purpose, the operating element 1 can be designed as a so-called passive, isometric or active regulating part. At all events, the forward-acting actuating force B introduces a vehicle acceleration, the rearward-directed actuating force V a deceleration and the torque D about the vertical axis 4 an equi-directional transverse movement of the vehicle, that is to say steering movement. In the case of a passive, preferably spring-centred design of the regulating part, if appropriate with damping measures, the vehicle movement variable to be controlled is set as a function of the associated deflection of the operating element, for which purpose the operating element 1 is held on the centre console 2 so as to be movable in the corresponding direction of actuation. In the case of an isometric design of the regulating part, the operating element 1 remains fixed on the centre console 2, and the vehicle movement variable to be controlled is set as a function of the magnitude of the acting actuating force. Such force-dependent setting of the vehicle movement variable may also take place with regard to an active design of the regulating part, in which case the operating element is additionally deflected automatically as a function of the respectively attained actual value of the activated vehicle movement variable, in order to provide the driver with

relevant feedback. In an alternative active design, the vehicle movement variable to be controlled is set as a function of the deflection of the operating element and, for feedback, a reaction force is automatically exerted on the operating element 1 by means of a corresponding actuator assembly, the magnitude of the reaction force being a measure of the respectively attained actual value of the activated vehicle movement variable.

It goes without saying that any desired combinations of the passive, active and isometric functional principles may also be implemented for controlling or regulating the longitudinal and transverse movement of the vehicle by means of the operating element 1. Moreover, various further operating functional elements, such as, for example, for activating direction indicators, horn, headlamp flasher, windscreen-wiper, etc., can be integrated into the operating element 1 designed in the form of a vehicle, these operating functional elements being arranged preferably at those locations of the miniature-vehicle operating element 1 at which the activated function elements are located on the real vehicle.

Figures 2 and 3 illustrate a passive design of the operating element arrangement 1 by way of example. As may be seen from Figure 2, the operating element 1 rests on a slide 6 which is guided on the vehicle centre console 2 so as to be moveable in the longitudinal direction of the vehicle. The slide 6 is supported on its front and its rear side elastically on the centre console 2 by means of two spring elements 7, 8 and is thereby held in the specific position of rest when not being subjected to force. Damping elements 9, 10 arranged in parallel with the spring elements 7, 8 damp the longitudinal movement of the slide 6 together with the operating element 1 seated on it. A displacement sensor 11 records the deflection of the slide 6 out of its position of rest and transmits it to the following control unit [not shown] of the operating element arrangement.

To record the rotational movement of the operating

element 1 about its vertical axis 4, the said rotational movement being brought about by respectively subjecting it to torque, the operating element 1 possesses a shaft piece 12 which extends downwards, in line with the vertical axis 4 intersecting the rear axle 5 centrally, through a leadthrough orifice in the slide 6, and the rotational movement of the said shaft piece is recorded by a connected rotary potentiometer 13 which transmits the corresponding rotary-position information to the following control unit of the operating element arrangement. As may be seen from Figure 3, this rotational movement too is in each case assigned, for each direction of rotation, a spring element 14, 15 and a damping element 16, 17 which support the operating element 1 relative to the centre console 2 in such a way as to define a rotary-angle position of rest, out of which the operating element 1 can be deflected counter to the elastic spring forces. In the position of rest, the miniature-vehicle operating element 1 is located in a position corresponding to the real vehicle, that is to say its longitudinal and transverse axes are respectively parallel to the longitudinal and transverse axes of the real vehicle.

The foregoing description of a preferred exemplary embodiment shows that a particularly ergonomic and obvious control of the longitudinal and transverse movement of a motor vehicle is achieved by means of the operating element arrangement according to the invention. In comparison with a cardanically suspended operating element, an operating element actuation corresponding even better to the driver's intuitive desire for the vehicle behaviour to be achieved becomes possible. Thus, the rotational movement of the operating element corresponds directly to a desired cornering of the vehicle, without the desired transverse movement of the vehicle having to be inferred indirectly from a different steering movement.

If required, two of the miniature-vehicle operating elements shown may be provided, specifically one on the

right-hand side and the other on the left-hand side of the driver's seat. These may then be actuated alternately or simultaneously by the driver with his right hand and left hand, respectively, command collisions being prevented by means of suitable measures. As a further alternative, the miniature-vehicle operating element may be arranged on an independent console which can be positioned displaceably or, at any event, variably relative to the vehicle interior at various locations, for example in the right-hand or left-hand side region of the driver's seat.

Claims

1. An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, including a manually actuable operating element designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis.

2. An operating element arrangement according to Claim 1, wherein the operating element imitates the outer contour of a vehicle and is arranged so as to be capable of being subjected to torque about a vertical axis intersecting the rear axle.

3. An operating element arrangement according to Claim 2, wherein the operating element is arranged on a vehicle centre console or on a console which can be positioned variably in the vehicle interior.

4. An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, substantially as described herein with reference to, and as illustrated in, the accompanying drawings.

Amendments to the claims have been filed as follows

Claims

1. An operating element arrangement, incorporated in a motor vehicle, said operating element arrangement being adapted for controlling the longitudinal and transverse movements of the motor vehicle, including a manually actuable operating element designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis.

2. An operating element arrangement according to Claim 1, being incorporated in a motor vehicle, wherein the operating element imitates the outer contour of a vehicle and is arranged so as to be capable of being subjected to torque about a vertical axis intersecting the rear axle.

3. An operating element arrangement according to Claim 2, being incorporated in a motor vehicle, wherein the operating element is arranged on a vehicle centre console or on a console which can be positioned variably in the vehicle interior.

4. An operating element arrangement incorporated in a motor vehicle, said operating element arrangement being adapted for controlling the longitudinal and transverse movements of the motor vehicle, substantially as described herein with reference to, and as illustrated in, the accompanying drawings.

The Patent Office

Application No: GB 9713438.1 **Examiner:** Alan Habbijam
Claims searched: 1-4 **Date of search:** 11 September 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): B60K 26/00, 26/02, 41/00, 41/28 : G01L 5/22 : G05G 9/00, 9/02, 9/04, 9/047: G06K 11/18

Other: Online:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage			Relevant to claims
X	WO 93/04348 A1	(SPACEBALL TECHNOLOGIES)	See Figs 1&4 in particular.	1.
A	US 4701629	(CITROEN)	See especially Figs 1-3.	
X	US 4217569	(NEJEDLY)	See Figs 1&3 and related description.	1.
A	US 3022850	(BIDWELL)	See Figs 1&2.	

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
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E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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(54) **An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle**

(57) An operating element arrangement for controlling the longitudinal and transverse movement of a motor vehicle has a manually actuable operating element 1 which is designed analogously to a vehicle and which induces an acceleration operation when subjected to force in direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis 4. Preferably the vertical torque axis 4 intersects the rear axle 5 of the imitation vehicle.

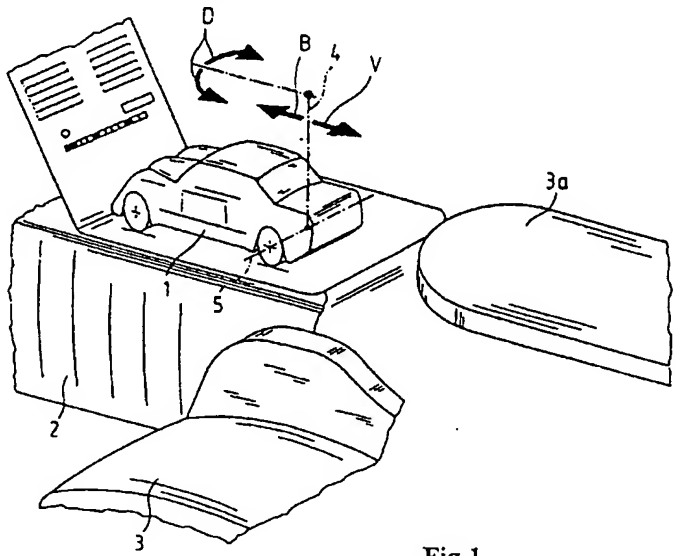

Fig.1

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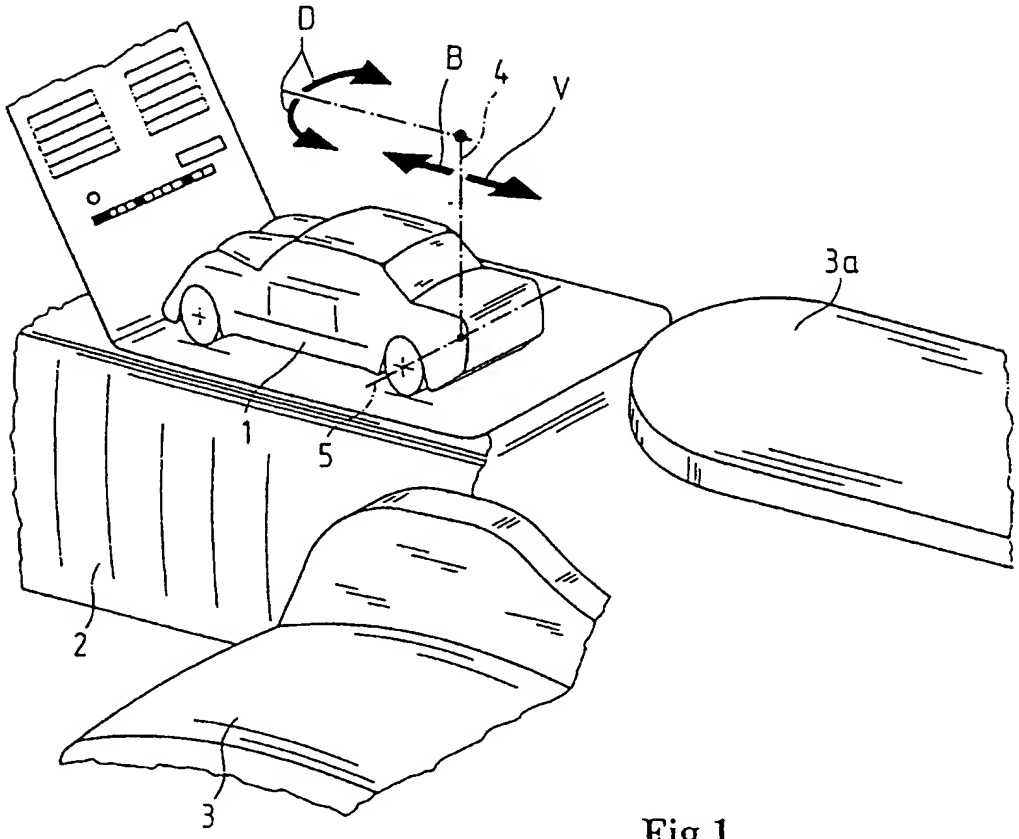

Fig.1

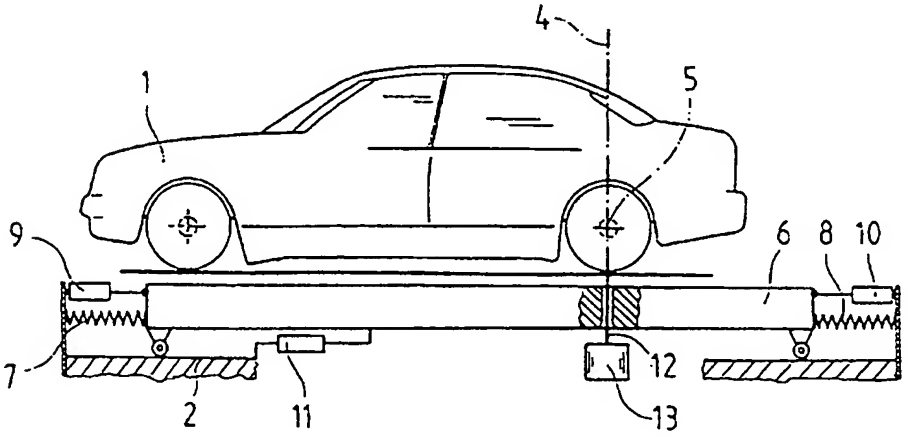

Fig.2

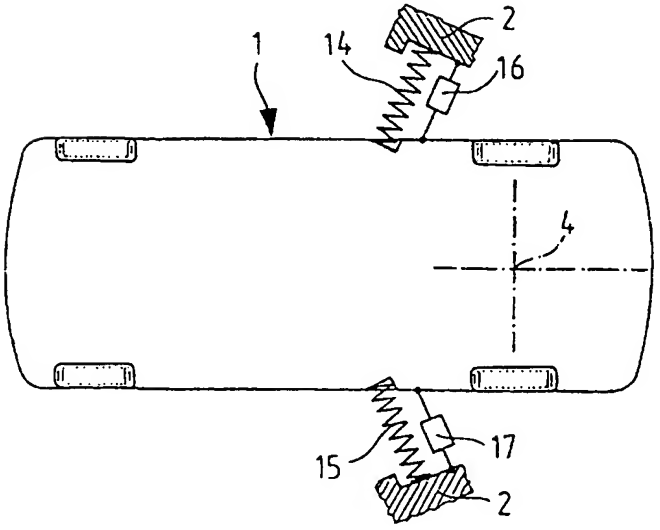

Fig.3

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Operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle

The invention relates to an operating element arrangement for controlling the longitudinal movement and transverse movement of a motor vehicle.

Conventionally, in an automobile, the steering wheel serves as an operating element for controlling the transverse movement and the accelerator pedal and brake pedal serve as operating elements for controlling the longitudinal movement. The paper by P. Bränneby et al., Improved Active and Passive Safety by Using Active Lateral Dynamic Control and an Unconventional Steering Unit, 13th International Technical Conference on Experimental Safety Vehicles, 4th to 7th November 1991, Proceedings Vol. 1, page 224, proposes, as an alternative to the conventional steering wheel, an operating lever which is arranged, for example, on the centre tunnel of the vehicle.

Furthermore, it is known to provide a common operating element for controlling the longitudinal and transverse dynamics of a motor vehicle, preferably the longitudinal movement being controlled by actuating the operating element in the longitudinal direction of the vehicle and the transverse movement being controlled by actuating the latter in the transverse direction, in particular as a rotational movement corresponding to the conventional steering wheel. Such an operating element is disclosed in patent specification US 3,022,850 in the form of a control stick which is mounted on a frame so as to be pivotable about a horizontal transverse axis, the frame, in turn, being rotatable about a horizontal longitudinal axis. A further operating element of this type, which is mentioned in the paper by H. Bubb, Arbeitsplatz Fahrer - Eine ergonomische Studie [Driver's area - an ergonomic study], Automobil-Industrie [Automobile Industry] 3/85, page 265, contains two mechanically interconnected plate-like handles

which are located closely next to one another and which are attached to the end of a bar which is guided movably on the vehicle centre console. The longitudinal dynamics of the vehicle are controlled by displacing the bar in the longitudinal direction of the vehicle, whilst the transverse dynamics are influenced by rotating the two plate-like handles in the transverse plane of the vehicle.

German Patent Application 195 48 717.6, which is not a prior publication, discloses an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, the said arrangement comprising two operating elements which can be actuated independently of one another and each of which is intended for controlling the longitudinal and transverse movements and is preferably designed as a manually actuable control stick. In this case, the manually actuable control sticks are cardanically suspended on a bracket on their underside and are designed as handles extending essentially vertically upwards. Coupling the two operating elements electronically prevents command collisions, for example due to the additive superposition of control command signals, due to the manual passive switching of one operating element in each case or due to the assignment of different priorities for the two operating elements.

The patent specification US 4,701,629 describes an operating element arrangement for activating various electrical vehicle components, such as various lights, front and rear windscreen-wipers, horn, window lifters and deicing system. The arrangement contains a carrier which is designed analogously to a vehicle and on which operating buttons assigned to the vehicle components to be activated are arranged at locations which preferably correspond to the position, on the vehicle, of the respectively associated vehicle component to be activated. The operating-button carrier designed analogously to a vehicle may be arranged on the dashboard or in the middle region of a steering wheel, and, even in the last-mentioned case, it is positioned so as

to be stationary relative to the vehicle, without co-rotating with the steering wheel.

The present invention seeks to provide an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle with a high level of operating and driving comfort.

According to the present invention there is provided an operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, including a manually actuable operating element designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis.

This arrangement contains a manually actuable operating element which is designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis. In this case, the design analogous to a vehicle means that the operating element has a vehicle-like shape which may vary between a parallelepipedal shape and an exact miniaturized imitation of the outer contour of the vehicle. At all events, the result of the special mounting of the operating element, such that an actuating force directed transversely forwards brings about a vehicle acceleration, an actuating force directed transversely rearwards brings about a vehicle deceleration and subjecting the operating element to torque about a vertical axis of the operating element parallel to the vertical axis of the vehicle brings about an equidirectional steering movement, is a particularly obvious operating element actuation which is associated directly with the desired vehicle behaviour

and in which the direction of the actuating force corresponds to the driver's intuitive desire for the vehicle behaviour. An essential contribution to this is made by the fact that the control of transverse movement by subjecting the operating element to torque does not take place about an essentially horizontal axis, as in the case of the conventional steering wheel, but about a vertical axis, this matching directly with the corresponding vehicle behaviour during cornering.

In comparison with conventional arrangements having a steering wheel for the control of transverse movement and an accelerator and brake pedal assembly, decoupled from it, for the control of longitudinal movement, the present operating element arrangement achieves further improvements relating to active and passive safety and to ergonomics. Thus, by means of the operating element, higher steering and regulating speeds can be achieved than with a conventional steering wheel, risks of accidents caused by the steering wheel and pedal assembly do not arise and there is no need to change pedals during transfer between braking and accelerating phases of the longitudinal movement of the vehicle. Moreover, dispensing with the steering wheel and the accelerator and brake pedal assembly results in a large amount of free space for placing the instruments. The operating element arrangement enables the driver to have a very comfortable body posture with a free choice of foot position. Furthermore, there is the possibility of shortening the vehicle by the space required hitherto for the steering wheel and the pedal assembly, whilst at the same time ensuring the same amount of space is available and that getting into the vehicle is improved.

In a preferred operating element arrangement, the operating element imitates the outer contour of a vehicle particularly obviously, and the vertical axis, about which the operating element is capable of being subjected to torque, is selected in such a way that it intersects the rear axle of this miniaturized outer contour of a vehicle.

This position of the vertical axis most closely resembles the transverse movements of conventional motor vehicles, in which the steering acts on the front-axle wheels.

In a further preferred operating element arrangement, the operating element imitating the outer contour of a vehicle is arranged on a vehicle centre console or on a separate console which may be positioned differently in the vehicle interior and which, for example, may optionally be positioned on the right-hand side or left-hand side of the driver's seat.

A preferred embodiment of the invention is illustrated in the drawings and is described below. In the drawings:

Figure 1 shows a perspective view of the region of the centre console of a motor vehicle with an operating element for controlling the longitudinal and transverse movements of the vehicle, the said operating element being designed in the form of a vehicle,

Figure 2 shows a diagrammatic view in longitudinal section of the operating element of Figure 1, and

Figure 3 shows a diagrammatic top view of the region of the operating element of Figure 1 designed in the form of a vehicle.

The operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, the said arrangement being shown in Figures 1 to 3 together with its components relevant here, contains an operating element 1, the shape of which imitates the outer contour of a vehicle and which at the same time is designed in an ergonomically favourable way as a handle part. This operating element 1 is arranged on the front horizontal region of a vehicle centre console 2 in a position corresponding to the real vehicle. It can be grasped and actuated comfortably by the right hand of the vehicle driver seated on a driver's seat 3, and the vehicle driver can rest his right arm on a suitably positioned driver's seat armrest

3a. The operating element 1 is mounted on the centre console 2 in such a way that it can be pressed forwards by the driver with a forward-directed force B, pulled rearwards with a rearward-directed force V and optionally subjected to a torque D in the clockwise or counter-clockwise direction, which torque acts about a vertical axis 4 of the miniature-vehicle operating element 1, the said vertical axis intersecting the rear axle 5 of the latter. By means of a suitable sensor assembly [not shown] having a following control unit, the operating element arrangement brings about a conversion of these actuating forces into corresponding control operations for the longitudinal and transverse movements of the vehicle.

For this purpose, the operating element 1 can be designed as a so-called passive, isometric or active regulating part. At all events, the forward-acting actuating force B introduces a vehicle acceleration, the rearward-directed actuating force V a deceleration and the torque D about the vertical axis 4 an equi-directional transverse movement of the vehicle, that is to say steering movement. In the case of a passive, preferably spring-centred design of the regulating part, if appropriate with damping measures, the vehicle movement variable to be controlled is set as a function of the associated deflection of the operating element, for which purpose the operating element 1 is held on the centre console 2 so as to be movable in the corresponding direction of actuation. In the case of an isometric design of the regulating part, the operating element 1 remains fixed on the centre console 2, and the vehicle movement variable to be controlled is set as a function of the magnitude of the acting actuating force. Such force-dependent setting of the vehicle movement variable may also take place with regard to an active design of the regulating part, in which case the operating element is additionally deflected automatically as a function of the respectively attained actual value of the activated vehicle movement variable, in order to provide the driver with

relevant feedback. In an alternative active design, the vehicle movement variable to be controlled is set as a function of the deflection of the operating element and, for feedback, a reaction force is automatically exerted on the operating element 1 by means of a corresponding actuator assembly, the magnitude of the reaction force being a measure of the respectively attained actual value of the activated vehicle movement variable.

It goes without saying that any desired combinations of the passive, active and isometric functional principles may also be implemented for controlling or regulating the longitudinal and transverse movement of the vehicle by means of the operating element 1. Moreover, various further operating functional elements, such as, for example, for activating direction indicators, horn, headlamp flasher, windscreen-wiper, etc., can be integrated into the operating element 1 designed in the form of a vehicle, these operating functional elements being arranged preferably at those locations of the miniature-vehicle operating element 1 at which the activated function elements are located on the real vehicle.

Figures 2 and 3 illustrate a passive design of the operating element arrangement 1 by way of example. As may be seen from Figure 2, the operating element 1 rests on a slide 6 which is guided on the vehicle centre console 2 so as to be moveable in the longitudinal direction of the vehicle. The slide 6 is supported on its front and its rear side elastically on the centre console 2 by means of two spring elements 7, 8 and is thereby held in the specific position of rest when not being subjected to force. Damping elements 9, 10 arranged in parallel with the spring elements 7, 8 damp the longitudinal movement of the slide 6 together with the operating element 1 seated on it. A displacement sensor 11 records the deflection of the slide 6 out of its position of rest and transmits it to the following control unit [not shown] of the operating element arrangement.

To record the rotational movement of the operating

element 1 about its vertical axis 4, the said rotational movement being brought about by respectively subjecting it to torque, the operating element 1 possesses a shaft piece 12 which extends downwards, in line with the vertical axis 4 intersecting the rear axle 5 centrally, through a leadthrough orifice in the slide 6, and the rotational movement of the said shaft piece is recorded by a connected rotary potentiometer 13 which transmits the corresponding rotary-position information to the following control unit of the operating element arrangement. As may be seen from Figure 3, this rotational movement too is in each case assigned, for each direction of rotation, a spring element 14, 15 and a damping element 16, 17 which support the operating element 1 relative to the centre console 2 in such a way as to define a rotary-angle position of rest, out of which the operating element 1 can be deflected counter to the elastic spring forces. In the position of rest, the miniature-vehicle operating element 1 is located in a position corresponding to the real vehicle, that is to say its longitudinal and transverse axes are respectively parallel to the longitudinal and transverse axes of the real vehicle.

The foregoing description of a preferred exemplary embodiment shows that a particularly ergonomic and obvious control of the longitudinal and transverse movement of a motor vehicle is achieved by means of the operating element arrangement according to the invention. In comparison with a cardanically suspended operating element, an operating element actuation corresponding even better to the driver's intuitive desire for the vehicle behaviour to be achieved becomes possible. Thus, the rotational movement of the operating element corresponds directly to a desired cornering of the vehicle, without the desired transverse movement of the vehicle having to be inferred indirectly from a different steering movement.

If required, two of the miniature-vehicle operating elements shown may be provided, specifically one on the

right-hand side and the other on the left-hand side of the driver's seat. These may then be actuated alternately or simultaneously by the driver with his right hand and left hand, respectively, command collisions being prevented by means of suitable measures. As a further alternative, the miniature-vehicle operating element may be arranged on an independent console which can be positioned displaceably or, at any event, variably relative to the vehicle interior at various locations, for example in the right-hand or left-hand side region of the driver's seat.

Claims

1. An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, including a manually actuable operating element designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis.

2. An operating element arrangement according to Claim 1, wherein the operating element imitates the outer contour of a vehicle and is arranged so as to be capable of being subjected to torque about a vertical axis intersecting the rear axle.

3. An operating element arrangement according to Claim 2, wherein the operating element is arranged on a vehicle centre console or on a console which can be positioned variably in the vehicle interior.

4. An operating element arrangement for controlling the longitudinal and transverse movements of a motor vehicle, substantially as described herein with reference to, and as illustrated in, the accompanying drawings.

Amendments to the claims have been filed as follows

Claims

1. An operating element arrangement, incorporated in a motor vehicle, said operating element arrangement being adapted for controlling the longitudinal and transverse movements of the motor vehicle, including a manually actuable operating element designed analogously to a vehicle and which induces an acceleration operation when subjected to force in the direction of the vehicle front, a deceleration operation when subjected to force in the direction of the vehicle rear and an equidirectional transverse movement of the vehicle when subjected to torque about a vertical axis.

2. An operating element arrangement according to Claim 1, being incorporated in a motor vehicle, wherein the operating element imitates the outer contour of a vehicle and is arranged so as to be capable of being subjected to torque about a vertical axis intersecting the rear axle.

3. An operating element arrangement according to Claim 2, being incorporated in a motor vehicle, wherein the operating element is arranged on a vehicle centre console or on a console which can be positioned variably in the vehicle interior.

4. An operating element arrangement incorporated in a motor vehicle, said operating element arrangement being adapted for controlling the longitudinal and transverse movements of the motor vehicle, substantially as described herein with reference to, and as illustrated in, the accompanying drawings.

The Patent Office

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Claims searched: 1-4 **Date of search:** 11 September 1997

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): F2Y (YTA)

Int Cl (Ed.6): B60K 26/00, 26/02, 41/00, 41/28 : G01L 5/22 : G05G 9/00, 9/02, 9/04, 9/047: G06K 11/18

Other: Online:WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage			Relevant to claims
X	WO 93/04348 A1	(SPACEBALL TECHNOLOGIES)	See Figs 1&4 in particular.	1.
A	US 4701629	(CITROEN)	See especially Figs 1-3.	
X	US 4217569	(NEJEDLY)	See Figs 1&3 and related description.	1.
A	US 3022850	(BIDWELL)	See Figs 1&2.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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